3.45

Calculating Injection Rates

A grower wants to inject chlorine at a concentration of 2 ppm through a drip irrigation system to treat biological clogging. The vineyard irrigation system has 400 vines with two, 1 GPH emitters per vine. Using a bleach product that has a chlorine content of 8.25%, what is the injection rate?

$$IR = \frac{0.0006 \times F \times C}{P}$$

F = Flow, gpm $400 \text{ vine} \times \frac{2 \text{ emitters}}{\text{vine}} = 800 \text{ emitters} \times \frac{1 \text{ gal}}{\text{hr}} = \frac{800 \text{ GPH}}{60 \text{ min/hr}} = 13.3 \text{ gpm}$

C = 2 ppm

P = 8.25%

$$IR = \frac{0.0006 \times 13.3 \text{ GPM} \times 2 \text{ PPM}}{8.25\%}$$

$$IR = 0.019 \text{ gal/hr} \approx 0.02 \text{ GPH}$$

Another grower is having trouble with mineral build up and clogging of his drip emitters. He wants to inject 35% Hydrochloric Acid at a concentration of 0.6%. The irrigation system has a flow rate of 20 gallons per minute. What is the acid injection rate in GPH? What is the rate in GPM? In ml per minute?

$$IR = \frac{0.006 \times F \times C}{P}$$

F = 20 gpm

C = 0.6% = ppm ≈ .1% = 1000 PPM
.6% = 6000 PPM

P = 35%

$$IR = \frac{0.0006 \times F \times C}{P}$$

$$IR = \frac{0.0006 \times 20 \text{ GPM} \times 6000 \text{ PPM}}{35\%} = 20.57 \text{ GPH}$$

$$IR_{GPM} = \frac{20.57 \text{ GPH}}{60 \frac{\text{min}}{\text{hr}}} = 0.34 \text{ GPM}$$

$$IR_{ml/min} = \frac{20.57 \text{ GPH}}{.016 \text{ GPH}} = 1285.6 \text{ ml/min}$$

* 1 ml/min = 0.016 GPH

Calibration Worksheet

An injector pump is installed on a drip irrigation system at a vineyard. The irrigation system is made up of 2, 1 GPH Drip Emitters per vine with an average of 700 vines per acre. The grower wants to apply a chemical for control of root rot. The product label has an application rate of 15.3 fl. Oz per Acre for a single application or 7.6 Fl. Oz per Acre for a split application.

If the grower wants to apply a single application during a one 1-hour irrigation event, what calibration rate should the grower set the injector pump for (per acre)?

1) In ounces per hour Note Single application = 15.3 oz/acre
   if 1 hr irrigation then = 15.3 oz/acre/hr
2) In ounce per minute
   Divide by 60 $\frac{15.3\ oz/hr}{60\ min/hr} = 0.255\ oz/min$
3) In milliliters per hour
   * 1oz = 29.57ml $\frac{15.3\ oz}{hr} \times \frac{29.57\ ml}{1\ oz} = 452.42\ ml/hr$
4) In milliliters per minute
   $\frac{452.42\ ml/hr}{60\ min/hr} = 7.54\ ml/min$ or $\frac{0.255\ oz}{min} \times \frac{29.57\ ml}{1\ oz} = 7.54\ ml/min$

If the grower wants to split the application during a two 1-hour irrigation events, what calibration rate should the grower set the injector pump for (per acre)?

5) In ounces per hour Note split application = 7.6 oz/acre
   if 1 hr irrigation then = 7.6 oz/acre/hr
6) In ounces per minute
   Divide by 60 $\frac{7.6\ oz/hr}{60\ min/hr} = 0.127\ oz/min$
7) In milliliters per hour
   * 1oz = 29.57ml $\frac{7.6\ oz}{hr} \times \frac{29.57\ ml}{1\ oz} = 224.73\ ml/hr$
8) In milliliters per minute
   $\frac{224.73\ ml/hr}{60\ min/hr} = 3.75\ ml/min$ or $\frac{0.127\ oz}{min} \times \frac{29.57\ ml}{1\ oz} = 3.75\ ml/min$